# Bachelor of Science in Physics: Concentration in Astrophysics – PHYS

## Associate Degree for Transfer Roadmap

This is a sample pathway for students who transfer to San Francisco State University in the current Bulletin year with an AS-T in Physics. Twenty-four units in the major (MATH 226, MATH 227, MATH 228, PHYS 220, PHYS 222, PHYS 230, PHYS 232, PHYS 240, PHYS 242) and all lower-division GE requirements have been satisfied. Additional units in the major may have been satisfied. Check with a major advisor about the most appropriate course sequence. *Degree completion guaranteed in 60 units; see the Associate Degree for Transfer (ADT) section for more information ([http://bulletin.sfsu.edu/undergraduate-admissions/transfer-students](http://bulletin.sfsu.edu/undergraduate-admissions/transfer-students)).*

### Course Title Units
#### First Semester
- **ASTR 301** Observational Astronomy Laboratory 1 2
- **MATH 245** or **MATH 376** Elementary Differential Equations and Linear Algebra or Ordinary Differential Equations I 3
- **PHYS 320** Modern Physics I 7 3
- **GE Area A: Written English Communication II (A4)** or University Elective if A4 was met before transfer 3
- **GE Area UD–B: Upper Division Physical and/or Life Sciences** 3

**Units** 14

#### Second Semester
- **ASTR 300** Stars, Planets, and the Milky Way 6 3
- **ASTR 340GW** The Big Bang - GWAR 6 3
- **CSC 309** Computer Programming for Scientists and Engineers 3
- **PHYS 360** Electricity and Magnetism I 6 3
- **PHYS 370** Thermodynamics and Statistical Mechanics 6 3

**Units** 15

#### Third Semester
- **ASTR 400** Stellar Astrophysics 1 3
- **HIST 470** or **HIST 471** The U.S. Constitution to 1896 or The U.S. Constitution since 1896 3
- **PHYS 430** Quantum Mechanics I 1 3
- **PHYS 460** Electricity and Magnetism II 1 3
- **GE Area UD–B: Upper Division Physical and/or Life Sciences** or University Elective if UD-B is Already Satisfied 3

**Units** 15

#### Fourth Semester
- **ASTR 470** Observational Techniques in Astronomy 6 3
- **ASTR 498** & **PHYS 695** or **ASTR 697** Astronomy Research Literature or Senior Project 3
- **RRS 600/HIST 466** or **AIS 460** History of People of Color in the U.S. or Power and Politics in American Indian History 3

**Units** 16

**Total Units** 60

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1. **ASTR 301**, **ASTR 400**, **PHYS 320**, **PHYS 430** and **PHYS 460** offered fall semesters only. 
2. Take **PHYS 330** if **MATH 245** complete. 
3. A course in differential equations and linear algebra is required before taking **PHYS 330** and **PHYS 385**. Students transferring in without an equivalent to **MATH 245** must delay taking **PHYS 330** and **PHYS 385** until the following Fall semester, which will affect other elements of this sample roadmap. Overall time for degree completion will be extended. *Students in this situation should consult with a department advisor for an alternate advising plan.*
4. If **ENG 214** or equivalent must be completed before enrollment in **ASTR 340GW**.
5. Take **PHYS 385** if **MATH 245** complete.
6. **ASTR 300**, **ASTR 340GW**, **ASTR 470**, **ASTR 697**, **PHYS 360** and **PHYS 370** offered spring semesters only.
7. **PHYS 385** must be taken before **PHYS 360**.
9. **AIS 460** and **HIST 466** satisfy GE: UD-D and US History.

### To Do at SF State:

Enough total units to reach 120 minimum for graduation; 40 units minimum at the upper-division level; to include the following:

#### University-Wide Requirements: 9-12 Units
- **ENG 214** or equivalent A4 course if not completed prior to transfer (0-3 units)
• Upper division GE (9 units): If necessary, specific choices can be made to satisfy the US History and Government requirements and UD-C and UD-D at the same time. See notes.

• Students entering the major with the AS-T in Physics are not required to fulfill SF State Studies or Complementary Studies requirements.

Physics B.S. (Astrophysics) Major: 44-47 units
MATH 226, MATH 227, MATH 228, PHYS 220, PHYS 222, PHYS 230, PHYS 232, PHYS 240, PHYS 242 met in transfer.

• Prerequisites (3 units if MATH 245 equivalent not completed before transfer; see note 3 above)

• Upper-division Requirements (38 units)

• Upper-division Electives (6 units): Units in physics or astronomy selected with consent of advisor. Three of the six elective units must be in course(s) numbered 400-499. No more than one unit of a 600-level ASTR course may count towards the electives.

University Electives: Four or More Units
Depends on course choices made at the community college, how transferred units are applied to the requirements above, and course choices at SF State. Some courses may meet more than one requirement, e.g., both in UD GE and the major.